presented model provides an opportunity to simulate burden in specific age bands, population burden, change in burden due to vaccination, and the seasonal/long-term cost effectiveness of vaccination with/out accounting for indirect protection effects. This study was sponsored by MedImmune.

VA7

COMPARISON OF DIFFERENT STATIC AND DYNAMIC SIMULATION TECHNIQUES FOR THE INFLUENCE OF CHILDREN PNEUMOCOCCAL VACCINATION

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OBJECTIVES: Estimating the possibility of preventing pneumococcal illnesses by vaccination of infants with the 7-valent serum is realized with decision tree based models as "State of the Art". A new network of models introducing the possibility of 1) Comparing and validating the different approaches in a qualitative and quantitative way with each other, and 2) improving the capacity of simulation with dynamical behavior, structural insights and extended sensitivity analysis. **METHODS:** Based on a Markovian-Model from literature [1] the system was re- implemented and validated with the given data set. Starting with this model, results for Austrian data were computed. After this an ODE was implemented as a "transponder" model, validated with the Markovian-Model and extended by dynamical behavior. In parallel an Agent Based model was implemented, validated with the transponder model and extended by individual agent behavior to simulate herd immunity and serotype replacement. **RESULTS:** Models can be adapted comfortably to additional data or new structural information; the approach is complex due to the fact that dynamic behavior can be represented and still flexible for adapting to different scenarios; the model has modular structure, as population dynamics, illness and economical effects are modelled in different modules, which can be exchanged if necessary; and outcomes are comparable to each other in a qualitative and quantitative way. **CONCLUSIONS:** Results in the final version of the agent based simulation vary from the starting model significant. The reasons for the changes are described and can be followed step by step as all models are White-Box-Models and therefore can be re-simulated with given data. The Agent Based Model is identified as more realistic simulation of real behavior. Reference: [1] McIntosh, et al: The cost-burden of paediatric pneumococcal disease in the UK and the potential cost-effectiveness of prevention using 7-valent pneumococcal conjugate vaccine.

VA8

HOW SHOULD HEALTH GAINS OF VACCINATION STRATEGIES BE DISCOUNTED?

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OBJECTIVES: Recently the Dutch government started immunizing Dutch girls with the human papillomavirus (HPV)-vaccine. Implementation of HPV-vaccination was controversial because different health-economic studies have estimated that the incremental cost-effectiveness ratios (ICER) of HPV-vaccination were just below or above the informal Dutch cost-effectiveness threshold. In the Netherlands, there are no differences in pharmacoeconomic guidelines and acceptable ICERs for vaccines and pharmacotherapies. It has recently been proposed that vaccines might warrant a different approach in estimating, interpreting and valuing the ICER. One of the aspects considered relates to the discount rate. In this study, we estimated the impact of different discount rates and approaches for discounting the health benefits of HPV-vaccination. **METHODS:** A previously developed HPV Markov model was used to estimate the impact of discounting on the ICER of HPV-vaccination, with the discount rate for health benefits ranging from -4% to +4%. Besides the discount rate, the impact of two different discounting methods was estimated. The first method has been specifically developed for infectious diseases, and proposes that health gains should be discounted from the moment of risk reduction (averted HPV infection). The second method uses proportional discounting, which implies that the discount rate decreases over time. **RESULTS:** When we estimated the ICER of HPV-vaccination according to the Dutch guidelines, we found an ICER of €18,400/QALY. Ranging the discount rate from –4% to +4% resulted in an estimated ICER of €680 and €84,200 per QALY, respectively. Applying both alternative models resulted in ICERs of €12,800 and €8,960 per QALY, respectively. **CONCLUSIONS:** As expected, the exact discount rate and the underlying model for discounting have a considerable impact on the ICER of HPV-vaccination. The use of different discounting methodologies for vaccination, in comparison with therapeutic interventions, might provide a more realistic estimation of future health benefits for vaccination strategies and result in more favorable ICER values.

PODIUM SESSION IV: COST STUDIES

CO1

ESTIMATE AVERAGE MEDICAL COSTS IN THE PRESENCE OF RIGHT-CENSORING

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OBJECTIVE: To address the common issue of incomplete follow-up data in cost-effective analysis, we compared the actual average cumulative medical costs with the estimated costs using a set of statistical methodologies applicable to censored cost data. **METHODS:** A study cohort with monthly recorded concomitant medication costs was selected from the population of a randomised clinical trial. Among a total of 70 subjects, a pattern of 25% non-informative censoring was applied prior to the endpoint of interest (the first event between death and 1-year follow-up visit). Statistical methods applied to deal with censored data included naïve estimators from complete case analysis (CCA) and available-case analysis (ACA), as well as Lin's, inverse-weighted and regression-based multiple-time-interval estimators. The covariate considered in regression models was continuous variable age. Bootstrapping with 10,000 replications was used to obtain the standard deviation (SD). **RESULTS:** The actual average total cost per subject was £268.7 (SD: £52.0). Estimations from the 5 methods given by mean (SD) were: CCA: £467.7 (£110.8), ACA: £246.0 (£49.8), Lin's estimator: £301.6 (£60.6), inverse-weighted estimator: £294.5 (£15.6), regression-based method: £245.5 (£49.2). **CONCLUSIONS:** By ignoring subjects with incomplete cost data, CCA overestimated the average cumulative cost as subjects with shorter survival tend to cumulate higher costs. Lin's and inverse-weighted non-parametric estimators that make no assumption for the distribution of cost data slightly overestimated the average total cost. Regression-based method gave better results for both mean and SD than one-sample estimators (Lin's and inverse-weighted) as it considered one cost-related factor (age) as covariate. The multiple-time-interval strategies (Lin's, inverse-weighted and regression-based) effectively assess cost information from censored subjects by treating them as uncensored in some of the time intervals. However, in this situation, small-size dataset and light censoring make ACA the best estimator.

CO2

ACCOUNTING FOR THE DRUG LIFE CYCLE AND FUTURE DRUG PRICES IN COST EFFECTIVENESS ANALYSIS

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OBJECTIVES: Economic evaluations of health technologies typically assume constant real drug prices and model only the cohort of patients currently eligible for treatment. It has recently been suggested that in the UK, we should assume that real drug prices decrease at 4% p.a., and in New Zealand, that real drug prices decrease at 2% p.a. and at patent expiry, the drug price falls. It has also recently been suggested that we should model cohorts of patients starting treatment in the future. In this paper, the cost-effectiveness of drugs is modelled based on these ideas. **METHODS:** Algebraic expressions are developed to capture all costs and benefits over the entire life cycle of a new drug. The lifetime of a new drug in the UK, a key model parameter, is estimated as 33 years, based on the historical lifetime of drugs in England over the last 27 years. Cost-effectiveness is calculated for seven new drugs recently appraised in the UK. **RESULTS:** Under the proposed methodology, all seven drugs appear far more cost-effective in the UK than published. For example, the incremental cost-effectiveness ratio decreases by 45%, from £31,100 to £17,000 / QALY, for imatinib versus interferon-a for chronic myeloid leukemia. **CONCLUSIONS:** The "life cycle correction factor" is introduced, which is used to convert estimates of cost-effectiveness as traditionally calculated into estimates under the proposed methodology. Under the methodology, all drugs in the UK and New Zealand appear more cost-effective, many far more cost-effective. Therefore, I suggest that the willingness to pay threshold should be reduced in the UK and New Zealand. The ranking of cost-effectiveness will change with drugs assessed as relatively more cost-effective and medical devices and surgical procedures relatively less cost-effective than previously thought. The methodology is very simple to implement and should be parameterized for other countries.

CO3

INDIRECT SOCIAL COST OF MULTIPLE SCLEROSIS: RESULTS FROM A REAL-WORLD OBSERVATIONAL STUDY

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OBJECTIVES: To assess work productivity loss among multiple sclerosis (MS) patients and the resulting indirect social cost due to MS from a real-world observational study. **METHODS:** ROBUST is a 12-month, US prospective, observational, open-label, single-arm, multi-center outcomes study of Interferon β-1b given every other day for relapsing forms of MS. For this analysis, baseline data from the Work Productivity and Activity Impairment questionnaire specific for MS (WPAI) were used. Productivity outcomes including absenteeism (work time missed), presenteeism (reduced on-the-job effectiveness) and overall work productivity loss were calculated from WPAI. Indirect social cost was estimated by modeling US national average wage